AALTO UNIVERSITY

SCHOOL OF ELECTRICAL ENGINEERING

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IMPLEMENTING LEED IN RUSSIA

Thesis submitted for examination for the degree of Master of Science in Technology
Espoo 10.10.2016

Thesis supervisor: Prof. Liisa Halonen

Thesis instructors: DSc (Tech.) Leena Tähkämö, MBA Östen Björkman

AALTO UNIVERSITY
SCHOOL OF ELECTRICAL ENGINEERING Abstract of the Master's Thesis

Author: Vadim Björkman

Name of the thesis: Implementing LEED in Russia

Number of pages: 45 + 8

Date: 10.10.2016

Department of electrical engineering and automation, Lighting unit

Professorship: Illumination engineering and electrical building services Code: S-118

Supervisor: Professor Liisa Halonen

Instructors: DSc (Tech.) Leena Tähkämö, MBA Östen Björkman

In the recent years, energy efficiency and environmental sustainability have been one of the major concerns around the globe. Many advanced countries have already included restricting environmental regulations into their legislation and this phenomenon is spreading. Environmental and energy efficiency issue concerns have also emerged in construction business, which have led to establishing non-commercial organisations such as LEED and BREAAM. A certified project by one of such organisations is guaranteed to be according to green quality and standards.

Such is not the case in Russia, having been only taking first steps in the direction of green construction. Seemingly, the potential for green building market is huge and some attempts of encouragement by the government have been made. In reality, there have been insignificant amount of certified project compared to leaders of green building such as US.

This study includes an introduction to LEED and an assessment for its future growth in Russia. The potential growth is measured based on inquiries and interviews from some of the major international and domestic companies that operate in Russia. Inquiries and interviews reflect the insight of these companies concerning the current state, future and overall interest in green construction. The results provide some hints for construction companies, how to develop their business to access the green building market in Russia.

Keywords: LEED, green building

AALTO-YLIOPISTO
SÄHKÖTEKNIIKAN KORKEAKOULU Diplomityön tiivistelmä

Tekijä: Vadim Björkman

Työn nimi: LEED:in toteuttaminen Venäjällä

Sivumäärä: 45 + 8

Päivämäärä: 10.10.2016

Sähkötekniikan ja automaation laitos, Valaistusyksikkö

Professuuri: Valaistustekniikka ja sähköinen talotekniikka Koodi: S-118

Valvoja: Professori Liisa Halonen

Ohjaaja: TkT Leena Tähkämö, MBA Östen Björkman

Viime vuosina energiatehokkuuteen ja kestävään kehitykseen kiinnitetään maailmanlaajuisesti yhä enemmän huomiota. Monet maat ovat jo lisänneet lainsäädäntöön rajoittavia ympäristösäädöksiä, ja tämä ilmiö on leviämässä. Kestävä kehitys ja energiatehokkuus ovat huolestuttavia aiheita myös rakennusalalla, mikä on johtanut ei-kaupallisten organisaatioiden kuten LEED ja BREAAM perustamiseen. Rakennusprojektit hankkivat kyseisiltä organisaatioilta sertifikaatteja, jotka takaavat projekteille vihreiden vaatimuksien mukaisen laadun.

Venäjän potentiaali vihreän rakentamisen markkinoilla on näennäisesti valtava. Tästä huolimatta Venäjä on ottamassa vasta ensiaskeleita vihreän rakentamisen suuntaan. Vaikka hallinto on ottanut käyttöön vihreitä säädöksiä, ne ovat luonteeltaan ohjeellisia eivätkä rajoita rakentamista tarvittavissa määrin. Tällä hetkellä Venäjällä on merkityksetön määrä sertifioituja projekteja verrattuna vihreän rakentamisen johtomaihin kuten Yhdysvallat.

Tässä työssä tutustutaan organisaatioon LEED ja arvioidaan sen kehittymistä Venäjällä tulevaisuudessa. Kehittyminen mitataan kyselyjen ja haastattelujen perusteella, jotka tehdään merkittäville kansainvälisille ja kotimaisille Venäjällä toimiville yrityksille. Kyseisten kyselyjen ja haastattelujen tarkoitus on kuvata yritysten näkökantaa koskien vihreän rakentamisen nykytilannetta, tulevaisuutta ja yleistä kiinnostusta siihen. Tulokset auttavat paikallisia rakennusyrittäjiä kehittämään omaa liiketoimintaansa vihreän rakentamisen suuntaan.

Avainsanat: LEED, vihreä rakentaminen

Acknowledgements

This Master's thesis has been written as partial fulfilment for the Master of Science degree in Aalto University, school of Electrical Engineering. My thesis was done at Quattroservices Limited Company alongside my work as project coordinator at Export Department.

I would like to thank my supervisor Professor Liisa Halonen for support, motivation and resolving many practical problems related to completion of this thesis. I am grateful to both of my instructors MBA Östen Björkman, who provided me with amazing ideas including the topic for this thesis and DSc (Tech.) Leena Tähkämö for valuable advice that supported me during writing process. I wish to express my gratitude to my family and friends as well, for having patience and believing in me throughout my studies.

Espoo 10.10.2016

Vadim Björkman

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Abbreviations

ANSI	American National Standards Institute
ASHRAE	the American Society of Heating, Refrigerating and Air-Conditioning Engineers
BOD	Basis Of Design
BREEAM	Building Research Establishment Environmental Assessment Method
CRI	Color Rendering Index
EPA	the U.S. Environmental Protection Agency
ESC	Erosion and Sediment Control
GBCI	Green Business Certification Inc.
HQE	High Quality Environmental standard (Haute Qualité Environnementale)
HVAC	Heating Ventilation And Air Conditioning
LEED	Leadership in Energy and Environmental Design
OPR	Owner’s Project Requirements
RuGBC	Russian Green Building Council
USGBC	U.S. Green Building Council
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SRI	Solar Reflectance Index
TR-55	Technical Release Number 55

1 Introduction

Many companies are becoming aware of the environmental and energy efficiency issues, while planning their future projects and investments. Some companies are abiding by the rules of legislation. Some want to gain economic or technical advance in their businesses. Some just want to display a positive image by appearing more energy conscious. The fact is, green building projects have been increasingly emerging in different advanced countries. To gain a credible environmental label, projects are getting certified by one of the expert organisations such as Leadership in Energy and Environmental Design program (LEED) and Building research Establishment Environmental Assessment Method (BREEAM) among others.

According to statistics of the year 2014, there have been over 23 000 LEED-certified projects and over 5 000 BREEAM-certified projects worldwide. However, a bit over 50 of LEED and BREEAM projects were certified in Russia alone. [1] These small numbers show, that green building market in Russia is only awakening comparing to the rest of the advanced countries. On the other hand, it is a sign of opportunity for construction companies specialized in green building design and realisation. One might speculate and wonder why the numbers are so small. The purpose of this study is to gain some insight from the perspective of investors and companies that actually operate in Russia. Their interest in green building would strengthen the pursuit for specialization of construction companies.

1.1 Research Problem

This study has two main questions:

1. What companies operating in Russia are expecting concerning LEED certification and green building in the near future?
2. How should construction company act based on the knowledge gained from the first question?

The first question paints an overall picture of the base of knowledge and attitudes of companies toward green building development in Russia. Based on the fact that Russian Green Building Council (RuGBC) has been established and its members growing, one may certainly conclude that some interest and knowledge exist. However, the number of certified projects is still comparatively very small. Consequently by learning from the companies, that are responsible for decision-making in building industry, one might get unique and first-hand insight to reasons for low growth of green building.

After expectations and opinions of the companies are clear, certain pathways of actions might become more favourable for construction companies based on this knowledge. Constructing and evaluating possible options by analysing obtained data will be the main focus of the second question.

A case study about extension of L'Oréal factory in Vorsino will be included in this work. The project is aiming to gain at least silver LEED certification level upon its completion. The case study illuminates some of the challenges of such a project constructed in Russia.

1.2 Research Scope and Objectives

The beginning of this study will concentrate on basic information about LEED. The idea is to familiarize the reader with information such as history, set of values, operating principles and development in Russia. After introduction to LEED, reader will readily

grasp the details of the company survey and subsequent analysis. Thus, this study will not delve too deep into specifics of LEED certification requirements, since the main purpose is to concentrate on the survey.

There are two challenges to the study: the selection of interviewed companies and the specificity of the survey. Ideally, the more participants the survey will cover, the better. Naturally, only companies involved in building their office and factory premises will be included. Private sector is not considered. The selection of the companies involved will be based not only their activity in Russia, but their brand, overall public impression on green matters and not to mention accessibility and openness through contact. Second challenge is considered while composing and executing the survey. However detailed and wide-ranging information would be preferred, this study must settle with general and rough answers. Questions cannot be too specific, since participants are expected to be on average poorly informed dealing with green building. Also, the willingness of a selected person to participate will be greatly affected by the length of the questionnaire. Therefore, the questionnaire should be kept relatively short, while not compromising the necessary required information.

Essentially, the goal of this study is to get the general picture on how the companies see the development of green building in Russia, how much value do they put into green building technology and are they interested in raising the green values of their business themselves. Key findings section of this study will be summing up the information mentioned above.

The case study part of this work will concentrate on the challenges of the project and general requirements of a LEED project specifically in Russia. Main objective of the study is to find out, whether there any special advantages or obstacles in aiming for LEED certification in Russia. An overall review of project technical design specification will be provided, limited to permission to disclose project information publicly.

The final section of this work will summarize the findings and conclusions will be drawn based on obtained data. The usability of data will also be evaluated.

1.3 Research Methods

This work is divided into five parts. The first part is focusing on literature review to cover all the general aspects of LEED and green building. The second part consists of phone inquiries and questionnaires. After conducting the survey, the data is analysed and compared to the literature review, overall predictions and statements available on media. Phone inquiries are analysed in qualitative manner. To be more specific, personal impressions of the attitude and answers will be taken into account. The questionnaire is analysed both in qualitative and quantitative manner, since it contains both elements. Taking the analysis into account, the third part concentrates on the necessary actions of green building service providers. The fourth part will be dedicated entirely to the case study. The research of the case study will be based on project design documentation. The last part will revise key findings and conclusions based on the performed survey, literature review and case study.

2 LEED

2.1 What is LEED?

Community's economy, environment and quality of life are greatly influenced by the processes of designing, developing and inhabiting the built environment. According to the U.S. Environmental Protection Agency (EPA), buildings are responsible for

- 36 percent of total energy consumption
- 30 percent of greenhouse gas emissions
- 13 percent water use
- 170 million tons per year of construction and demolition debris. [2]

Problems also include social and economic consequences such as degraded air quality, loss of open space and health impacts resulted from lack of physical activity and poor quality food. The green building movement is developing in many advanced countries. As a result, construction industry started to establish voluntary programs and standards related to energy-efficiency and sustainability. All of the programs have similar mutual goals including integrating local ecology into design and construction, to reduce natural resource impacts, to diminish non-renewable energy consumption, to use environmentally favourable products, to protect and conserve water resources, to enhance indoor environmental quality and improve operation and maintenance practises. [3]

LEED is voluntary green building certification system that is capable of independent verification of the design, construction, operation and maintenance sustainability of designated building and projects. It involves metrics such as energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, innovation in design, stewardship of resources and sensitivity to their impacts of their use. Successful projects result in having a certificate that is a proof of resource-efficient, high-performing, healthy, cost-effective building. [4]

A non-profit member organisation The U.S. Green Building Council (USGBC) was founded in 1993. Its mission was to advance sustainability practises in building and construction areas. The first goal was to create a sustainability rating system. As a result, in late 1998 USGBC membership approved LEED Version 1.0, which led to registering building totalling over a million square feet in size in the first year. [5] Over the years, LEED has advanced to version 4 having certified over 23 000 projects across the world.

2.2 LEED Benefits

The main goal of LEED certification is to encourage projects to be more environmentally conscious avoiding unnecessary additional costs. Certification is voluntary. Therefore, project teams are free to choose whatever options, which are suitable for particular project requirements within certification framework. By considering different options other than the obvious and more accessible ones, projects tend to have a greater impact on environmental progress.

There are several benefits that clients seek when deciding upon whether to obtain the certification:

- building performance benefits
- long-term cost savings
- differentiation, public benefits and leadership in green building
- society benefits.

Occupants' productivity and health issues are serious concerns while measuring building performance. Poor indoor quality costs can be amounted to hundreds of billions of dollars per year depending on the surveys. Although measuring benefits is complicated, generally buildings that provide better indoor environmental quality benefit from increased recruitment and retention rates. Healthier work environment is promoted by

- siting and building material
- lighting quality
- thermal and ventilation control
- commissioning, use of measurement and verification. [6]

When LEED certification is pursued, it usually means higher initial cost for design and construction. By investing more in the beginning of a project, the idea is to lower energy consumption, resource usage and operation costs. According to studies, energy consumption decreases 9%, water consumption decreases 20% and operation costs over 5 years decrease 15% [7].

Acquiring a LEED label is a viable way to differentiate from competitors, while seeking a competitive advantage in business market. Researching, assessing and implementing environmentally beneficial technologies generate more understanding in green building overall. Additional knowledge and experience triggers innovative approaches and essentially development of environmental leadership. LEED certificates positively affects the public image of the company. Considering the level of environmental consciousness worldwide, the various impacts of the image should not be underestimated.

Combining the benefits above, everything contributes towards improving general state of society by addressing quality of building, cost-savings and healthiness.

2.3 LEED certification process

The LEED certification process consists of four main steps, which is shown in a Figure 1.

During registration step the upcoming project is evaluated based on the minimum requirements for certification eligibility that include compliance with environmental laws, setting site boundaries, floor and occupancy requirements and readiness for whole-building data sharing. After confirming the met requirements, owner, agent and project administrator are assigned to fulfil the necessary roles of project team responsible for completing certification.

After registration is completed the team may begin to collect all the required documentation in order to apply for certification. As the construction project proceeds,

various information such as documentation, calculations and data analysis will be accumulated. This information acts as a proof for different selected credit points and prerequisites, which in the end determine the level of certification.

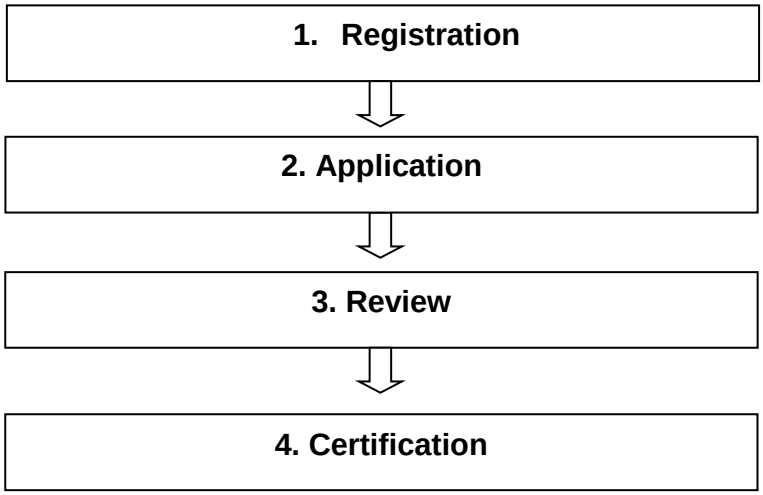

Figure 1: Simplified LEED certification process [8]

Green Business Certification Inc. (GBCI) will review all the submitted information after the project has been applied. There are four different review possibilities:

1. The whole application may be submitted for review after the project is completed.
2. The project may be split into design and construction parts, which are submitted separately.
3. The aim of precertification review is to refine the design and construction strategies for additional fee.
4. With an option of expedited review, the evaluation time is cut in half.

The final step in review process is certification acceptance. The conducted review will result in a report that includes all the earned perquisites and credit points. Based on the credit points, the project will be rewarded with LEED certification levels depicted in Figure 2. [8]

Figure 2: LEED certification levels and required credit points [9]

2.4 LEED Criteria in New Construction

Since the establishment of LEED, the idea of certification was to cover different possible project types that are

- Building Design and Construction

- Interior Design and Construction
- Building Operations and Maintenance
- Neighbourhood Development
- Homes. [10]

LEED provides a flexible framework within which different types of project may earn points in order to gain a desired certification level. This work will be focusing mainly on the first project type although the requirements for earning credits are very similar.

Table 1 provides a list of certification requirements in different categories and corresponding maximum credit points. The list includes a great amount of subcategories that have specific requirements.

Table 1: Certification requirement categories and corresponding credit points [11]

Location and Transportation		16
Sustainable Sites		10
Water Efficiency		11
Energy and Atmosphere		33
Materials and Resources		13
Indoor Environmental Quality		16
Innovation		6
Regional Priority		4
TOTALS	Possible Points:	110

2.5 LEED and Green Building Development in Russia

Considering, that LEED has existed for only about a decade, the green building market in Russia is rather undeveloped. Energy efficiency and conservation have been set as a top priority goal in the year 2008 to modernize Russian economy. Part of the approving the "Energy Saving and Energy Efficiency Improvement to 2020" the standards adopted are

- GOST R 54964-2012 "Environmental requirements for real-estate" is a conformity assessment method.
- STO NOSTROY 2.35.4–2011 "Green building. Buildings and civil construction. Rating system for evaluation sustainability of residential and public buildings" encompasses international ISO standards, construction and sanitary norms and regulations.
- STO NOSTROY 2.35.69–2012 "Green building. Buildings and civil construction. Consideration of regional characteristics in the rating estimation of sustainability in building construction" takes into account different regions present in Russia based on the climate, water and energy resources, and renewable power.

The above mentioned standards were deeply influenced by green building organisations such as LEED, BREEAM and others. [12]
At the moment there are 24 certified projects in Russia out of 80 attempted LEED certifications. It is notable, that over half of these projects have applied for higher level certifications, as can be observed in Table 2. In Figure 3 is depicted the cumulative emergence of new certifications since the first project in 2010.

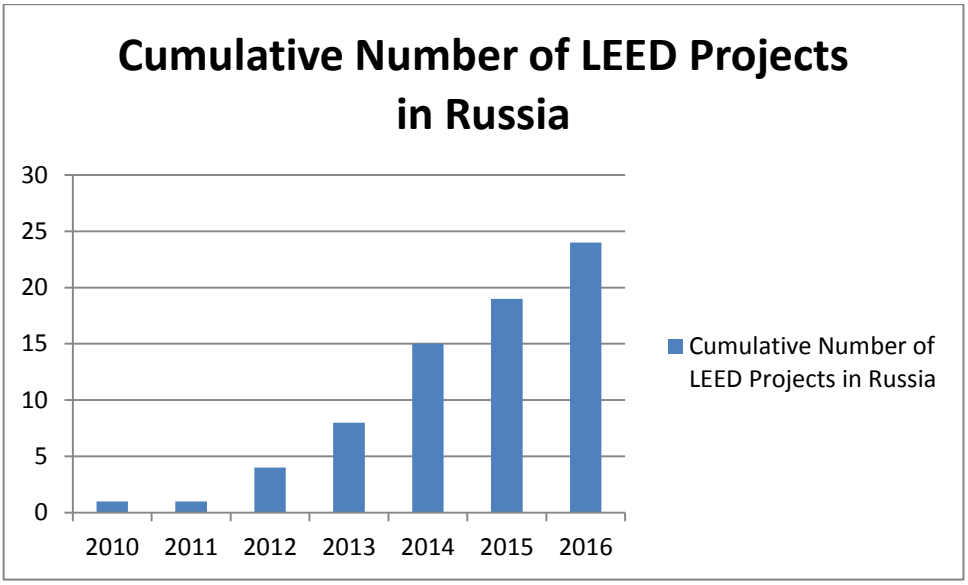

Figure 3 Cumulative emergence of new LEED projects in Russia. [13]

Table 2 Certification level of LEED Projects in Russia [13]

Certification level of LEED Projects in Russia	
Certified	3
Silver	7
Gold	14

The emergence of new projects has been stable, adding approximately four new projects per year. Certainly, considering the country under inspection, this figure could be much higher.

RUGBC has been investigating the reasons for growth and challenges for green development in Russia. According to their report in 2014 they recognize four drivers for growth.

1. Environmental regulations: Changes in legislation over the last decade have been positively influencing the green building market. Notable changes are possibility for tax burden reduction and bank loans for energy-efficient equipment.
2. Growing demand from tenants: International companies have set an example for leading Russian companies by acquiring green certifications.
3. Brand recognition: Future "green"-labelled building will have competitive advantage over building without certification.
4. Future cost efficiency: Even though quantification of cost savings in Russia is complicated, cost-efficiency is still considered one of the driving forces beside marketing.[1]

Respectively, the four challenges are recognized in the report:

1. Lack of knowledge base and small number of market professionals is an obstacle to create high amount of successful green projects.
2. Controversial role of the government that is not making green standards mandatory.
3. The availability and affordability of natural resources in Russia do not support more rational approach to energy and resource consumption.

4. Doubts related to cost-saving in green technology are affecting the market behaviour. [1]

All of these drivers and challenges are addressed in the interviews and key findings.

2.6 Green Building and LEED Information Resources

In the previous chapters, the background of green building and LEED are briefly described in order to smoothly lead a reader to interview and case study research. In case reader desires more in-depth information concerning the above mentioned topics, this work recommends the books by Linda Reeder [14], Jerry Yudelson [15], Sam Kubba [16][17] and Holley Henderson [18].

The first book covers green building in general, taking into account different green building organisations. The second book provides an overlook of green building trends in Europe. The third and fourth books thoroughly review LEED and its practises. The last book is a guide for sustainable architecture, design and development professionals.

3 Interviews

3.1 Methods

Before the interview, the participant list had to be acquired. Supposedly, a random list with companies operating in Russia, would have been the best, in terms of acquiring the largest amount of answers. However, first and foremost the quality of answers must be considered. Firstly, only companies that are actively building or show intentions in investing in construction projects should be considered for survey candidates. Secondly, considering the general situation in Russia, green building is not very known topic in construction. Consequently, companies that do not have an image of being environmentally conscious are less likely to be interested in interview. Finally, it is natural to ignore requests from unfamiliar persons, especially if it involves time investments. Therefore, to maximize success chance and fitting into time constraints, the best working solution is to select previous and current business partners that fit into the requirements above and actually have experience in working with our company. In the end a total of 34 contacts from 31 different companies were chosen.

The interview part is divided into 3 phases:

1. Preliminary e-mail inquiries
2. Phone inquiries
3. Questionnaire inquiries

In the preliminary phase of the interview, all the selected contact persons were sent an e-mail message with a request to participate in the survey. As experience shows, people only on rare occasion tend to actually take interest in such messages. In most cases, these types of messages are considered as advertisements or junk mail and are ignored. However, the goal of the first phase was not to acquire real answers, but to catch the attention of the recipients and to have a somehow familiar topic to discuss during phone inquiries. In other words, this was a preparation stage for the participants to facilitate the other two phases.

The first actual part of the interview consisted of phone inquiries. In order to fit into time constraints, each candidate for survey would be contacted for a total of 5 times, in case the first call is unsuccessful. There are two main ideas behind phone inquiries. The first one is to evaluate the actual interest in participation in survey, resulting in a yes or no type of answer. Second idea is to observe the attitude of the participant towards green building.

The main part of the interview consisted of a questionnaire. It was designed to be accessible, in order for participant not be overwhelmed with its length and to easily grasp the ideas behind each question. Most of the participants are managing directors or engineers by their occupation. Assuming, that they do not have any special knowledge about green building and LEED, the questions had to be general enough to be answered, but also serve a purpose for this work. Since the participants are international, Russian and English were chosen as the main languages of the survey. The topics selected for the questionnaire are

1. LEED in General
2. Green Building Certification Programs

3. Green Building Sector and Development of LEED in General
4. LEED Cost-efficiency
5. Information on Green Solutions.

All of the topics measure the overall interest in green building. The first topic considers the general knowledge about LEED and importance of different green construction goals. The second topic identifies the familiar certification organisations and their growth in Russia. The third topic concentrates on views of individual company concerning green building development in Russia. The fourth topic concerns the cost-efficiency of green building solutions. Finally, the goal of the fifth topic is to find out, how often investing companies receive information on green building. The full questionnaire is presented in Annex A.

Besides phone inquiries, each part of the questionnaire is evaluated separately as well, providing an individual conclusion based on the results. Having reached a conclusion based on the phone inquiries and each part of the questionnaire, a summarizing conclusion will be presented.

3.2 Phone Inquiry Results and Key Findings

As expected, the e-mail inquiries were ignored even though "read" notifications were received. Some of the contact information was outdated, resulting in failed delivery message. In the end, however, e-mail inquiries accomplished their mission introducing the topic to the participant before phone inquiries. Total of 31 phone inquiries were made, yielding the results shown in Table 3.

Table 3: Results of phone inquiries concerning participation in LEED survey

Result	**Quantity**	**Percentage out of total**
Will participate in survey	6	19 %
Cannot participate (no contact)	13	41 %
Cannot participate (not interested)	7	23 %
Cannot participate (company policy)	2	7 %
Cannot participate (LEED is unimportant)	3	10 %

The analysis of the willing participants will be done in subsequent chapters. The 25 persons, who could not participate in the survey, however, also managed provided rather interesting information for the purpose of this work.

First of all, out of 25 persons 13 would not reply to e-mail or phone calls. Deducing the real reason behind this behaviour is nearly impossible. The seven persons that refused to participate during the phone conversation also fit in this category. Whatever the reason, the fact is, that survey concerning green building is not worth investing their time. Consequently, these people view LEED and green building in Russia as unimportant. Comparing to the people above there were three persons that especially showed their negative attitude towards LEED. In their opinion, it is not something that would have a future in Russia. Apart from the people above, two persons regretted not being able to participate due to their company policies. On the contrary, their attitude seemed to be positive.

Overall conclusions based on the phone inquiries are depicted in Table 4.

Table 4 Conclusions from phone inquiries.

Conclusion	Quantity	Percentage
LEED is important	8	26 %
LEED is unimportant	23	74 %

3.3 Survey Results and Key Findings

After phone conversations, five out of six participants sent completed questionnaires with answers by e-mail. The sixth survey was filled during an interview via Skype with one of the participants (company D in survey result tables).

3.3.1 LEED in General

The first part of the questionnaire measures two aspects

1. The level of experience dealing with LEED certification (questions 2-4)
2. The importance of energy efficiency and environmental issues overall and categories affecting them (questions 1 and 5).

The questionnaire results of the part one are shown in Table 5.

Table 5 Survey results - LEED in General. Full questionnaire with accurate instructions is presented in Annex A.

PART I – LEED IN GENERAL						
Q01. How important does your company regard energy efficiency and environment issues, when planning and executing a new project?	**A**	**B**	**C**	**D**	**E**	**F**
1. Very unimportant						
2. Unimportant						
3. Neutral				x		
4. Important	x	x	x			x
5. Very important					x	
Q02. How familiar are your company with LEED rating system?	**A**	**B**	**C**	**D**	**E**	**F**
1. No information				x		
2. Little information			x			
3. Basic knowledge		x			x	x
4. Very knowledgeable	x					
Q03. How experienced your company is in using LEED certification in the past 10 years?	**A**	**B**	**C**	**D**	**E**	**F**
1. No experience		x	x	x		
2. Little experience					x	
3. A few certified projects	x					
4. Many certified project						
5. Most of our projects are certified						x
Q04. How interested your company is in acquiring LEED certification in future projects?	**A**	**B**	**C**	**D**	**E**	**F**

1. Not interested				x		
2. Low interest		x				
3. Interested			x		x	
4. Very interested	x					x
Q05. In your experience, which of the categories are most important, when achieving your green construction goals (0-5)?	**A**	**B**	**C**	**D**	**E**	**F**
Consumption savings	4	5	4	0	4	4
Energy efficiency	4	5	4	0	4	4
Sustainability	4	3	3	0	4	4
Life cycle	3	4	3	0	3	5
Innovation	2	2	2	0	4	3
Pioneering in Engineering	2	2	2	0	3	3
Global company policy	4	3	5	0	4	4

Observing the results concerning the first aspect, most of the companies do not have much knowledge or experience dealing with LEED. However, comparing to their knowledge and experience, companies show averagely moderate interest in acquiring LEED certification in the future. This desire is strongly supported by the results of the second aspect. All of the companies consider green construction goals important. Consequently, based on these result of the first part, conclusions of summary aspects are

1. Participants have low knowledge and experience in dealing with LEED.

2. Participants regard green construction goals important and are interested in LEED.

3.3.2 Green Building Certification Programs

The second part of the questionnaire measures

1. the knowledge of the companies concerning main known green building certification organisations (question 6)

2. future development of green building organisations in Russia (questions 8 and 7).

The questionnaire results of the part two are shown in Table 6.

Table 6 Survey results - Green Building Certification Programs. Full questionnaire with accurate instructions is presented in Annex A.

PART II – GREEN BUILDING CERTIFICATION PROGRAMS						
Q06. How familiar you are with the following organisations (1-5)?	**A**	**B**	**C**	**D**	**E**	**F**
BREEAM	1	1	1	1	3	3
LEED	4	1	3	1	3	5
HQE	3	1	1	1	1	1
DNGB	1	1	1	1	1	1
CASBEE	1	1	1	1	1	1
GBCA	1	1	1	1	1	2
Q07. In Europe and Western countries the amount of BREEAM, LEED, DGNB and HQE-certified projects has significantly grown in recent years. Do you expect the similar phenomenon in Russia?	**A**	**B**	**C**	**D**	**E**	**F**
1. No growth				x		

2. Little growth		x	x		x	
3. Growth	x					x
4. High growth						
5. No experience						
Q08. In your opinion, which of the following certification program organisations will be most popular in Russia in future?	**A**	**B**	**C**	**D**	**E**	**F**
None		x		x		
BREEAM					x	x
LEED	x					x
HQE			x			
DNGB						
CASBEE						
GBCA, Green star						
Other						

The most familiar organisation by far was LEED, according to the results, the other familiar companies being BREEAM, HQE and GBCA. However, even with LEED being the leader, the companies have averagely only little knowledge about this organisation. Additionally, companies believe there will be little growth of certified project in the future. Two of the companies do not believe in any of the proposed organisation. Most attention, concerning future popularity of organisations in Russia, is given to BREEAM, LEED and HQE. Based on these results of the second part, conclusions of summary aspects are

1. Participants are not familiar with most of the certification organisations having only a little knowledge of LEED.

2. The participants believe in the future there will be low growth of green building certified projects in Russia.

3.3.3 Green Building Sector and Development of LEED in Russia

The third part of questionnaire measures

1. Government green building standard levels comparing to the standard levels of the companies (questions 9 and 10)

2. Green construction business in the future (questions 11-13).

The questionnaire results of the part three are shown in Table 7.

Table 7 Survey results - Green Building Sector and Development of LEED in Russia. Full questionnaire with accurate instructions is presented in Annex A.

PART III – GREEN BUILDING SECTOR AND DEVELOPMENT OF LEED IN RUSSIA						
Q09. Russian government has recently approved a new standard concerning energy efficiency - GOST R 54964-2012, STO NOSTROY 2.35.4-2011 and STO NOSTROY 2.35.69-2012. In your experience, how demanding are local authorities considering green construction at this moment?	**A**	**B**	**C**	**D**	**E**	**F**
1. No demands			x	x		
2. Little demand	x	x			x	x
3. Demanding						
4. Very demanding						
5. No experience						

Q10. How demanding are your own company green standards and requirements compared to the demands of local authorities?	**A**	**B**	**C**	**D**	**E**	**F**
1. We have no requirements				x		
2. Our requirements are lower						
3. Our requirements are the same		x	x			
4. Our requirements are higher	x				x	x
Q11. How do you consider the growth of demand for green construction (in general) in the following 10 years in Russia?	**A**	**B**	**C**	**D**	**E**	**F**
1. No growth						
2. Low growth		x	x	x	x	
3. Growth	x					x
4. High growth						
5. No experience						
Q12. In your opinion, how important is the added value by contractor in green construction in Russia at this moment?	**A**	**B**	**C**	**D**	**E**	**F**
1. Very unimportant				x		
2. Unimportant						
3. Neutral	x	x			x	
4. Important			x			x
5. Very important						
6. No experience						
Q13. At the moment, do you find enough civil and engineering contractors that focus on green construction in Russia?	**A**	**B**	**C**	**D**	**E**	**F**
1. None				x		
2. Very few	x	x	x		x	
3. Some						x
4. Many						
5. Most of the contractors						

Averagely, the participants agree that government standards are very low concerning green building. On the other hand, only half of the participants have higher standards than the government, which show their desire to realise an environmentally high quality project despite the low standards. Participants also consider the amount of capable contractors being very low in Russia and the added value currently provided is not very important. These results support the general belief that future growth of demand for green construction will be low. Based on these results of the third part, conclusions of summary aspects are

1. Most of the companies have the same or higher standards concerning green building

2. Future growth of demand for green construction in Russia is low.

3.3.4 LEED Cost-efficiency

The fourth part of the questionnaire measures the cost-efficiency of green solutions (questions 14-16). The questionnaire results of the part four are shown in Table 8.

Table 8 Survey results, LEED Cost-efficiency. Company B did not provide an answer for the question number 16. Full questionnaire with accurate instructions is presented in Annex A.

PART IV – LEED COST-EFFICIENCY						
Q14. In your experience, how green solutions have impacted the cost-savings in projects?	**A**	**B**	**C**	**D**	**E**	**F**
1. Additional cost						
2. Some additional cost		x			x	x
3. Some cost-savings	x					
4. Cost-savings			x			
5. No experience				x		
Q15. If the green solutions are demanding additional cost, are they worth it in the long run?	**A**	**B**	**C**	**D**	**E**	**F**
1. Yes			x	x	x	x
2. No	x					
3. No experience		x				
Q16. Currently, the cost of energy in Russia is lower than in other European countries. Is it worth investing in more energy efficient solutions considering the future development of energy market in Russia?	**A**	**B**	**C**	**D**	**E**	**F**
1. Very unimportant		-				
2. Unimportant		-				
3. Neutral		-				
4. Important	x	-	x	x	x	x
5. Very important		-				

The opinion concerning cost savings from green solutions is divided, half of the companies gaining some additional costs and the other have obtaining cost savings. However, four out of six participants think that even if green solutions demand additional cost, they are worth investing in the long run. All of the participants agree, that energy efficient solutions are worth investing in the future. Based on these results, conclusion is that energy efficiency and green solutions are worth investing in despite them possibly adding additional costs to the project.

3.3.5 Information on Green Solutions

The fifth part of questionnaire measures

1. How actively contractors take part into developing green solution together with the client (questions 17 and 18).

2. How interested the client potentially is in obtaining green solution propositions (questions 19 and 20).

Table 9 Survey results - Information on Green Solutions. Company B did not provide answers for questions number 17 and 18. Full questionnaire with accurate instructions is presented in Annex A.

PART V – INFORMATION ON GREEN SOLUTIONS						
Q17. How often contractors propose you alternative green solutions in project realisation phase?	**A**	**B**	**C**	**D**	**E**	**F**
1. Never	x	-		x		
2. Rarely		-	x		x	x
3. Sometimes		-				
4. Often		-				

Q18. If you receive green solution propositions, how often do you implement them?	**A**	**B**	**C**	**D**	**E**	**F**
1. Never		-		x		
2. Rarely		-	x			
3. Sometimes		-			x	
4. Often	x	-				x
5. No experience		-				
Q19. How often do you look for information about recent technical innovations concerning energy saving aspects?	**A**	**B**	**C**	**D**	**E**	**F**
1. Never				x		
2. Rarely			x			
3. Sometimes	x	x			x	
4. Often						x
Q20. Would you be interested in a newsletter with descriptions of cost-saving solutions that contractors have recently applied on their on-going projects?	**A**	**B**	**C**	**D**	**E**	**F**
1. No interest	x					
2. Little interest						
3. Interested		x	x	x		x
4. Very interested					x	

Based on the survey results, it is clear that contractors very rarely participate in developing green solutions together with the companies. However, such attempts are valued by the companies in most cases, where proposed green solutions are implemented. It seems, companies are not very active to seek the green solutions themselves, but is interested in receiving such information. Based on these results of the third part, conclusions of summary aspects are

1. Contractors should be more active in proposing green solutions to the companies

2. Companies might not know about recent green solution, and appreciate receiving such information.

3.3.6 Key findings

In chapter 3.2 the conclusion concerning the attitude of the companies towards LEED is that majority consisting of 74% out of total regards to LEED as unimportant. Additionally, based on the performed questionnaire, this work gained separate results from each topic that are:

1. Participants have low knowledge and experience in dealing with LEED.

2. Participants regard green construction goals important and are interested in LEED.

3. Participants are not familiar with most of the certification organisations having only a little knowledge of LEED.

4. The participants believe, in the future there will be low growth of green building certified projects in Russia.

5. Most of the companies have the same or higher standards concerning green building

6. Future growth of demand for green construction in Russia is low.

7. Energy efficiency and green solutions are worth investing in despite them possibly adding additional costs to the project.

8. Contractors should be more active in proposing green solutions to the client

9. Clients might not know about recent green solution, and appreciate receiving such information.

Having in mind the initial goals of this work, further interpretations and elaboration are in place, based on the result from the survey.

The companies have little knowledge about certification programs. Nevertheless, they are interested in them, are willing to receive information on new green building solutions and apply them in their projects. On the other hand, there are few viable contractors, who have the competence to manage such projects. Additionally, capable contractors rarely propose new solutions to their clients. The first key finding is, that there is a lack of contractors in Russia, whose characteristics are

- capability of realising green building projects

- sufficient knowledge of certification programs and green building solutions

- capability to apply higher building standards than are required by the government at the moment

- initiative to propose green solutions and other relevant information to the client.

According to the survey, companies regard green construction valuable and are ready to sacrifice additional costs the goals being more important. However, they think that overall the growth of new certified projects and growth of the demand for green building will be low. These two facts are confirmed by the initial conclusion that majority of companies do not value LEED and by statistics in Figure 3 showing the low emergence of certified projects in the past. Based on this information, the second key finding is that in Russia there are specific companies that require green construction services. While there are few contractors available, the ones that are capable have an immense competitive advantage over the other contractors. By differentiating, the contractors will have access to a building market area that their competitors do not.

The exponential growth of new green construction might not be repeated in Russia, even though this was the case in North America and Europe. Having differentiated their business to cover green building, the contractors already have an advantage. The third key finding is that in case of exponential growth of demand for certified projects in the future, the contractors with knowledge about managing green building projects will be the first ones to benefit.

Contractors are not the only ones, who may find opportunities from green building market in Russia. The companies, having interest in green construction and even stricter requirements than local authorities, do not possess sufficient knowledge. The companies that are not interested in green building probably possess even less knowledge. The fourth key finding is that the current situation in Russia may be considered as an opportunity for certification organisations, architectures, designers and know-how companies to realise their potential. Actions, such as taking initiative in providing solutions and advertising while seeking potential buyers, may trigger a productive result. Such attempts may raise the interest of so called dormant Russian companies and promote green building in general, having a positive impact on demand and producing more environmentally conscious projects.

4 Case study L'Oréal

L'Oréal is planning to build an extension to existing factory in Vorsino, Kaluga region, Russia. Extension will be constructed at the same campus at the east part of the factory. The area is approximately 13 000 square meters.

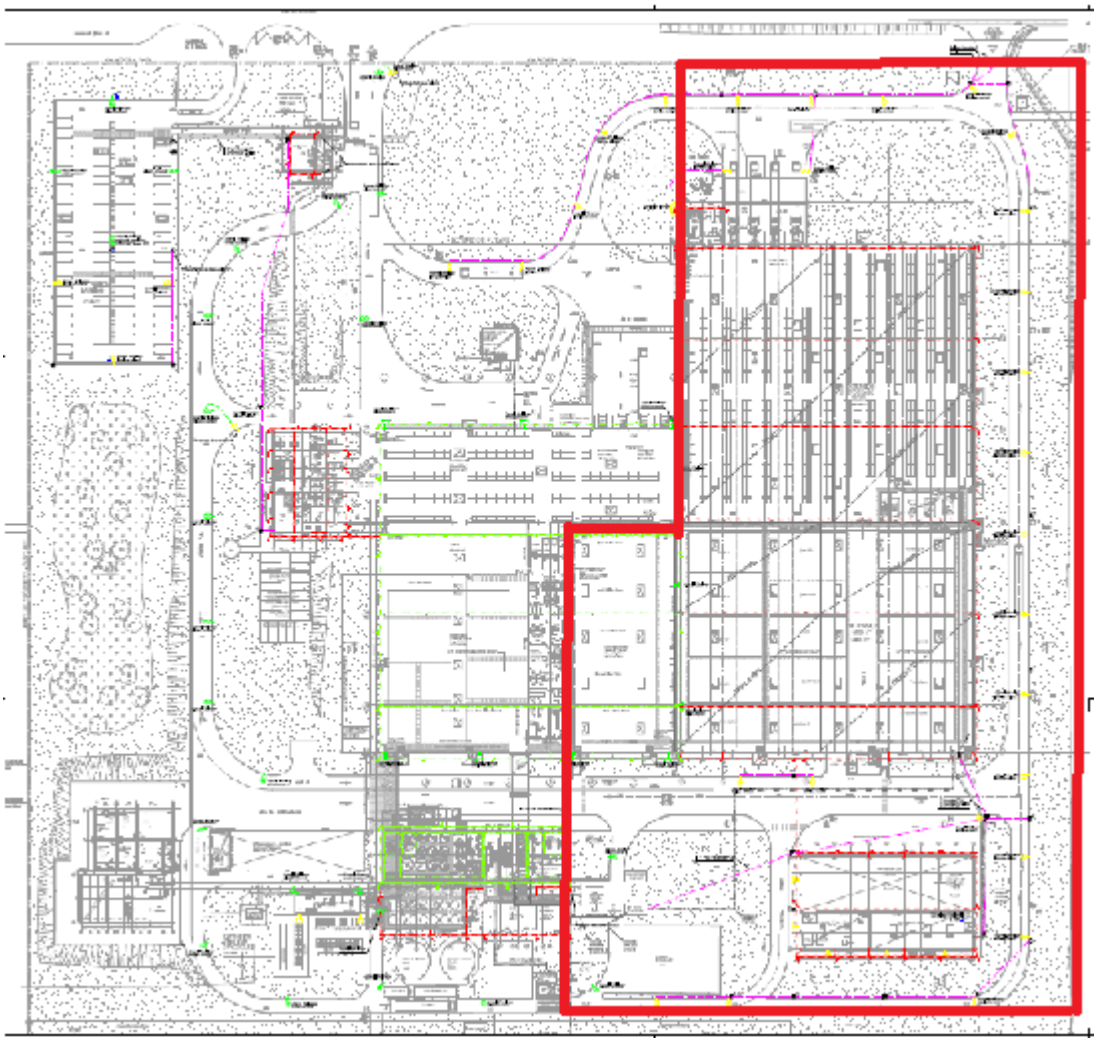

Figure 4 Main plan of the site with extension marked within red boundaries [19]

The project has adopted a LEED Gold certification level as its main sustainability goal. For this purpose, LEED rating system v4 for Building Design and Construction: New Construction and Major Renovation was selected.

Using the LEED v4 credit checklist for Building Design and Construction [11], project sustainability goals will be explained in more detail in the subsequent chapters.

4.1 Integrative process

Figure 5 Integrative Process is one of the criteria for LEED v4 for BD+C: New Construction and Major Renovation. Projects Checklist is a tool for project managers to help them tracking their goals, by

marking whether the conditions for a particular criteria has been achieved (Y, yes, green box), is uncertain ("?", yellow box) or has not been achieved (N, no, orange box). [11]

Integrative process brings together people, systems, organisations and practises, having as its goals the increase of project value for the client, diminishing mistakes and maximizing effectiveness in all phases of the project.

The goals for gaining the credit point are

- preliminary energy usage analysis
- preliminary water usage analysis
- issuing Owner's Project Requirements (OPR) and Basis Of Design (BOD) according to the result of the previous analyses.

4.2 Location and Transportation

LEED v4 for BD+C: New Construction and Major Renovation
Project Checklist

0	0	0	**Location and Transportation**		**16**
			Credit	LEED for Neighborhood Development Location	16
			Credit	Sensitive Land Protection	1
			Credit	High Priority Site	2
			Credit	Surrounding Density and Diverse Uses	5
			Credit	Access to Quality Transit	5
			Credit	Bicycle Facilities	1
			Credit	Reduced Parking Footprint	1
			Credit	Green Vehicles	1

Figure 6 Credit points for Location and Transportation [11]

Figure 6 depicts the main topics and corresponding credit points for LEED Location and Transportation. The topics are discussed in more detail considering the requirements to achieve the credit points for the main criteria.

4.2.1 Sensitive Land Protection

Main goals of Sensitive Land Protection are not to allow construction on ecologically valuable sites and to lower negative impact of construction on the environment. Therefore the site must not have any characteristics of

- prime farmland
- floodplain with flood risk being over 1 %
- habitat of endangered and valuable animals or plants
- water bodies
- wetlands.

In order to fulfil these requirements an evaluation of the site environment and other corresponding documents must be presented.

4.2.2 High Priority Site

High Priority Site requirements are aiming to facilitate the construction of the project in areas with restrictions for building and promote the health of the surrounding area. In case of L'Oréal, the project is situated in the industrial park Vorsino, which has special tax conditions and satisfies the above mentioned requirements.

4.2.3 Surrounding Density and Diverse Uses

The requirements consider the amount of the buildings and availability of services in the neighbourhood of the project. Goals of Surrounding Density and Diverse Uses are

- land conservation
- protection of farmland
- protection of wildlife
- promotion of walking routes
- stimulation of effective and reasonable use of land
- shortening driving distances
- promotion of healthy life style through increase of physical activities.

The project is situated 16 kilometres from logistic terminal and 1,6 kilometres from highway.

4.2.4 Access to Quality Transit

This section considers the diversity of available transportation and the impact of transport on greenhouse gas emissions and overall negative impact on nature and health. Project organisation will provide sufficient information concerning public transportation schedules, documentation of future plans or reconstruction of existing transportation routes, location map within project boundaries with accessible pedestrian walkways.

4.2.5 Reduced Parking Footprint

Parking footprints that impacts the environment include dependence on motor vehicles, occupied parking lot area and rainwater runoffs. The Transportation Planning Handbook by the Institute of Transportation will be used to estimate the number of car trips generated by building type. The project must succeed in lowering the minimum allowed parking lot spaces by the local government. Project planning must also account for privileged car pool parking lot spaces, which is 5 % of the total quantity of parking lots, minimum requirement being 5 parking lots.

4.2.6 Green Vehicles

Main goal of the Green Vehicles is to minimize the environment pollution by introducing alternatives to conventionally fuelled vehicles. Project will include plans with locations of charging points on site. Minimum 50 % of loading platform must be equipped with electrical sockets for charging trucks.

4.3 Sustainable Sites

LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

0	0	0	**Sustainable Sites**		10
Y			Prereq	Construction Activity Pollution Prevention	Required
			Credit	Site Assessment	1
			Credit	Site Development - Protect or Restore Habitat	2
			Credit	Open Space	1
			Credit	Rainwater Management	3
			Credit	Heat Island Reduction	2
			Credit	Light Pollution Reduction	1

Figure 7 Credit points for Sustainable Sites [11]

Figure 7 depicts the main topics and corresponding credit points for LEED Sustainable Sites. The topics are discussed in more detail considering the requirements to achieve the credit points for the main criteria.

4.3.1 Construction Activity Pollution Prevention

Main goal of this section is to lower pollution by controlling erosion, soil sedimentation and minimizing dust by following 2012 EPA Construction General Permit principles. The principles are

- pollution control of natural water reservoirs and rainwater runoffs
- perimeter control of the construction site soil transportation
- transport dirt control
- assuring the covering of inert storage material
- controlling the transportation routes, restricting access to off-road courses
- effective construction site cleaning and dust reduction.

The project must provide Erosion and Sediment Control (ESC) plan with monthly situation reports and declaration of conformity to the plan.

4.3.2 Site Assessment

Project site must undergo a preliminary assessment for constructing possible means for sustainable development and acquire the data for the relevant decisions concerning the architecture of the site. The analysis will include

- topography (contours, topographical features, stability of slopes)
- hydrology (flood risk, wetlands, lakes, rivers, the potential for the collection and use of rainwater infiltration, calculation of Technical Release Number 55 (TR-55))
- climate (exposure to sun, wind, temperature)

- vegetation (type of native plants, endangered species, unique, invasive, natural habitat, greenfield areas)

- soils (Agricultural land - prime farmland, healthy soils, previously developed land)

- human factors (scenery, local transport infrastructure, the surrounding areas, materials reuse potential)

- effects on human health (proximity to major air pollution sources, adjacent areas for physical activity).

4.3.3 Site Development – Protect or Restore Habitat

Project must prioritize conserving the natural environment, repairing damaged areas in order to assure natural habitat and promote biodiversity. Restoration of damaged areas must include at least 30% but preferably 60 % of the site area using local or adaptive plants. Project having floor area ratio over 1,5 may include the green areas on the roof. The restored soil properties include

- similarity to original soil

- upper layers not being prime farmland or greenfield

- original organic composition, density, infiltration intensity, biological function of soil and chemical characteristics.

Therefore project must provide a landscape plan together with restored soil characteristics report.

4.3.4 Open Space

Project must consider an open space, contributing to interaction with the environment, social interaction, passive recreation and physical activity.

- Open space must be more that 30% of the total site area, with minimum of 25% of green areas. It must be noted, that simple grass lawn is not considered as a green area.

- Open area must be accessible, consisting of green area and an artificial pond stimulating social activity and recreation.

Open space requirements include beautification plans, description of plantations and activities in the area.

4.3.5 Light Pollution Reduction

Main goals for this section are as follows

- Increase access to night sky

- Improve visibility at night

- Decrease of human impact on the nature and wildlife.

Solutions include

- controlling the direction of light from the luminaire

- setting appropriate lighting limits on the site area
- luminance should not exceed 200 cd/m2 at night and 2000 cd/m2 during the day.

Documentation consists of outdoor lighting plan, illuminance calculations of individual lighting fixtures, at the border of the site and of interior signboards.

4.3.6 Rainwater Management

The main goal of the management is reducing the amount of surface runoff and improving water quality. Based on historical conditions and undeveloped ecosystems in the region, the natural hydrology and water balance in the area can be reproduced. The means for managing rainwater include

- diminishing impervious surfaces
- controlling runoffs
- rainwater retention.

4.3.7 Heat Island Reduction

Heat Island Reduction is necessary for minimizing the impact on microclimate of the site, when people locations and wildlife are considered. Project must choose appropriate material for roof and pedestrian walkways in order to control solar reflectance:

- roof solar reflectance index (SRI) must be over 82
- pedestrian walkways SRI must be over 39.

4.4 Water Efficiency

LEED v4 for BD+C: New Construction and Major Renovation
Project Checklist

0	0	0	**Water Efficiency**		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
			Credit	Outdoor Water Use Reduction	2
			Credit	Indoor Water Use Reduction	6
			Credit	Cooling Tower Water Use	2
			Credit	Water Metering	1

Figure 8 Credit points for Water Efficiency [11]

Figure 8 depicts the main topics and corresponding credit points for LEED Water Efficiency. The topics are discussed in more detail considering the requirements to achieve the credit points for the main criteria.

4.4.1 Outdoor and Indoor Water Use Reduction

Water usage outdoor will be reduced significantly by not including territorial watering system into the project. Plan must include description of plant types and their watering needs.

Main goal of indoor water use is to reduce it 40 % of initial scenario. This is possible by choosing specific sanitary equipment with low water consumption.

4.4.2 Building-level and Cooling Tower Water Metering

Building-level Water Metering is aiming to manage water consumption control and recognize opportunities for additional savings. Main solutions for management include installing permanent water consumption meters for drinking water and issuing monthly and annual reports. USGBC requires water consumption reports within 5 years after construction.

Cooling Tower Water Metering aims to reduce water consumption used in cooling water, while restricting corrosion and water pollution. Cooling towers are to be carefully specified in order to meet the required conditions.

4.4.3 Water Metering

There are two options in requirements for water metering overall:

1. Installation of two or more water metering systems to encompass 80 % of water consumption including
    - territorial watering
    - interior sanitary equipment
    - hot water supply
    - daily technical water consumption.
2. Water metering system covering 100 % of water consumption for
    - boilers, using over 100 000 gallons of water or having power of 150 kW
    - water recirculation.

4.5 Energy and Atmosphere

LEED v4 for BD+C: New Construction and Major Renovation
Project Checklist

0	0	0	**Energy and Atmosphere**		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
			Credit	Enhanced Commissioning	6
			Credit	Optimize Energy Performance	18
			Credit	Advanced Energy Metering	1
			Credit	Demand Response	2
			Credit	Renewable Energy Production	3
			Credit	Enhanced Refrigerant Management	1
			Credit	Green Power and Carbon Offsets	2

Figure 9 Credit points for Energy and Atmosphere [11]

Figure 9 depicts the main topics and corresponding credit points for LEED Energy and Atmosphere. The topics are discussed in more detail considering the requirements to achieve the credit points for the main criteria.

4.5.1 Optimize Energy Performance

By increasing energy efficiency of the building and its systems, the goal is to lower the negative impact on the environment and economy for using too much energy.

The areas of construction that will be optimized are

- thermal resistance and heat transfer coefficient values for roof and wall materials
- productivity, flow volume, recuperation, frequency control and filtration levels for air handling units, specified according to facility type
- lighting energy consumption reduced to 57% indoor and 40% outdoor from initial estimations, by assigning appropriate irradiance values for each indoor facility type or outdoor area
- indoor and outdoor lighting control optimized by using daylight, presence sensors, dimming and automatic shutdown according to a set schedule.

4.5.2 Renewable Energy Production

Using renewable energy is aiming to reduce negative impact on environment and economy by avoiding fossil fuels, when possible, and utilizing renewable sources.

Project will be aiming for the highest ratio of renewable energy per total energy usage in a building according to the credit points in Table 3.

Table 10 Percentage of renewable energy per total energy consumption [20]

Percentage of renewable energy per total energy consumption	Credit points in New Construction
1%	1
5%	2
10%	3

4.5.3 Green Power and Carbon Offsets

Credit points will be awarded for issuing an agreement for renewable energy delivery for the period of minimum 5 years. Intentions are to sign an agreement for renewable energy delivery encompassing 100% of project energy consumption. Additionally, an agreement with Green-e (independent certification and verification program for renewable energy and greenhouse gas emission reductions) or Carbon offset (program for emission reductions of carbon dioxide and other greenhouse gases) is intended for gas energy.

4.5.4 Fundamental Commissioning, Verification and Enhanced Commissioning

The aim of commissioning and verification is to assure that design, construction and operation is according to the requirements of the client concerning energy, water, environmental quality and reliability.

The measures being compulsory in order to ensure quality commissioning are

- verifying OPR and BOD
- developing and implement a plan for acceptance
- developing a pilot installation sheets
- developing test procedures
- ensuring a workable system
- keeping a list of defects and of open questions
- preparing a final report for acceptance of systems
- documenting the identified deficiencies and provide recommendations for the owner.

The information for operation manual must include

- description, algorithms, operation and maintenance schedules for Heating Ventilation And Air Conditioning (HVAC), electrical and plumbing systems
- building operation schedule and testing plan
- HVAC unit list including requirements for outdoor air volumes
- building illuminance levels
- HVAC control according to seasons, daily and 24 hour time periods.

The building systems that must be commissioned are

- mechanical HVAC systems
- water supply, sewage and hot water systems
- electrical systems including energy distribution, natural and electrical lighting
- renewable energy systems
- automation of the above mentioned systems.

Enhanced commissioning includes training for operation management and ensuring procedure and operation testing and verifying the building systems including individual equipment.

4.5.5 Building-Level Energy Metering and Advanced Energy Metering

Building-level energy metering concerns energy management issues and opportunities for optimizing building-level energy efficiency even further. Energy data is collected from electricity usage, gas, central cooling and steam systems, fuel supply and biomass. Advanced energy metering considers especially the systems that account for more than 10% of annual energy consumption. Advanced metering includes features such as

- energy meters with update frequency of at least once per hour, considering consumption, load and power factor
- data collection system and retention for the period of 36 month

- remote access to the data through Internet
- reporting system capable of providing data on an hourly, daily, monthly and annual basis.

4.5.6 Demand Response

Project is aiming to participate in demand response technologies and programs, making energy generation and distribution systems more efficient, increasing network reliability and reducing greenhouse gas emissions. Main goal is to reduce peak demand at least 10%. This includes total design and implementation of demand response program. The features incorporated by the program are

- control of truck charging times by automatic shutdown of charging stations
- control of cooling equipment by raising temperature by 2 Celsius degree
- lowering AHU operating speed by 75 % or 50 % for short period of 1-2 hours
- control of compressor operation
- notification system of the program being active using energy monitoring display.

4.6 Indoor Environmental Quality

LEED v4 for BD+C: New Construction and Major Renovation
Project Checklist

0	0	0	**Indoor Environmental Quality**		16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
			Credit	Enhanced Indoor Air Quality Strategies	2
			Credit	Low-Emitting Materials	3
			Credit	Construction Indoor Air Quality Management Plan	1
			Credit	Indoor Air Quality Assessment	2
			Credit	Thermal Comfort	1
			Credit	Interior Lighting	2
			Credit	Daylight	3
			Credit	Quality Views	1
			Credit	Acoustic Performance	1

Figure 10 Credit points for Indoor Environmental Quality [11]

Figure 10 depicts the main topics and corresponding credit points for LEED Indoor Environmental Quality. The topics are discussed in more detail considering the requirements to achieve the credit points for the main criteria.

4.6.1 Thermal Comfort

Thermal control is one of the means to improve the productivity and wellbeing of workers. It includes managing humidity, air speed, radiant and air temperature.

The equipment employees should have access to depending on the workstation is

- Packing facility: temperature control (summer and winter)

- Storage: temperature control (winter), fan speed regulation (summer)
- Office: opening windows, split systems, individual thermostats on radiators
- Mechanical premises: fan speed and operation control, individual thermostats, radial heaters.

4.6.2 Acoustic Performance

Acoustic design should contribute to productivity and wellbeing of the employees, as well as ensure working communication. Managing acoustics involves

- Controlling noise levels from HVAC equipment according to 2011 the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Handbook, HVAC applications, including measurements according to American National Standards Institute (ANSI) S1.4
- Designing sound insulation and reverberation according to LEED standards
- Sound enhancement design
    - STI 0.60 or CIS 0.77
    - minimum noise 70 dBA
    - sound uniformity +/- 3 dB, 2000 Hz
- Sound masking should not allow noise levels above 48 dBA

4.6.3 Minimum Indoor Air Quality Performance

Minimum Indoor Air Quality Performance involves managing fresh air volume measurements and controlling air quality.

Minimum requirements in the project may be observed in the Table

Table 11 Requirements for HVAC equipment according to ASHRAE 62.1-2010

	Room Description	Area sq. m.	Persons	Fresh l/s	Fresh l/s	Exhaust m3/h	Notes
1	Office 1	23,8	6	27,68	100		Required CO2
2	Locker room	15,5				139,5	2,5 ls/m2
3	Office 2	29,7	5	26,76	97		
4	Warehouse	588,4	6	2244,9	8 082		
5	Mechanical workshop	148,1	7	210,36	758		
6	WC men	10,3				180	90 m3/h per unit
7	WC women	10,3	14			270	90 m3/h per unit
8	Sorting Area 1	5051,2	6	3854,9	13 878		
9	Sorting Area 2	1773		1358,25	4890		

Air quality monitoring requires flow meter values for alternating consumption being +/- 10% of design values and air flow balancing and fan current sensor for continuous consumption.

4.6.4 Enhanced Indoor Air Quality Strategies

In order to incorporate enhanced strategies, the requirements to complete are:

- Dirt trapper mat length of at least 3 meters on the movement paths
- AHU filtering class level F7
- exhaust consumption in dirty areas according ASHRAE
- CO2 sensors in offices and mechanical facilities
- specific pollution sensors in storage an packing facilities.

4.6.5 Environmental Tobacco Smoke Control

The goal is to minimize the impact of smoking on workers, building surfaces and air distribution in project environment.

Requirements include

- prohibiting smoking inside the building
- except in designated areas for smoking, prohibiting smoking outside the building at a distance of at least 7.5 meters from entrances to the building, outdoor air intakes and opening windows
- prohibiting smoking outside of the project boundaries in places intended for commercial purposes
- placing a sign indicating the ban on smoking within 3 meters from all entrances.

4.6.6 Low-Emitting Materials and Indoor Quality Assessment

By acquiring low-emitting materials, project aims to lower concentration of chemical components, that decrease the quality of the air, have negative impact on health and productivity of employees.

Indoor quality assessment involves a thorough airing of the building before commissioning and air testing for 40 harmful substances.

4.6.7 Construction Indoor Air Quality Management Plan

The measures to be implemented during construction phase in order to maintain air quality are

- Preparing a plan for air quality management in construction phase and prior to commissioning.
- Complying with the requirements of Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Guidelines for Occupied Buildings Under Construction-2007, ANSI / SMACNA-2008.
- Protecting absorbent materials stored at the facility from moisture.

- Not to use permanent air filter during construction period (minimum filtration class during the construction period - MERV 8 or F5).

- Prohibiting smoking during construction inside the building and in a radius of 7.5 m from any entrances.

4.6.8 Daylight and Quality Views

Daylight management strives for improving productivity and working conditions of the employees.

Better use of daylight includes both improving control by having access to manual or automatic brightness control in working place and having illuminance between 300-3000 lx for more than 75% of the surface of working place.

Quality views requires that 75 % of facilities have access to the windows in the direct line of sight, and two of the conditions that are

- having access to windows in multiple direct lines of sight

- having sightings such as plantations, wildlife, sky, moving objects and object at the minimum distance of 7,5 m

- open view at the distance of 3 times greater than the height of the window.

4.6.9 Interior Lighting

Interior lighting involves the general requirements that include

- Standard lighting fixtures and luminaires in daylight area must be independently controlled.

- Lighting fixtures in the area of natural light should be controlled by a separate multi-level light sensor (including dimming) being located at a certain distance from the control zone with easy access to calibration.

- In the natural light, multi-level light sensor should reduce the electrical load with an interval step from 50 to 70% of full load and an additional step no more than 35% of full load.

When choosing lighting fixtures four of the characteristics must be implemented:

- Lighting fixture luminance must be less than 2,500 cd/m2 at 45-90 degree angle from roof.

- Color Rendering Index (CRI) must be over 80 in all facilities.

- More than 75 % of the electric load must fall on Light-Emitting Diode (LED) L70 luminaires with a life span of 24000 hours.

- Direct overhead light must not exceed 25 % of the total electric load on lighting.

- For 90% of the area the weighted average reflectance is 85% for ceiling 60% for walls and 25% for floors.

- Weighted average reflectance for furniture is 45% for work surfaces and 50% for movable parts.

- For 75% of the area the ratio between the average illuminance of the wall (excluding the window.) and average illuminance of working surfaces should not exceed 1:10, the weighted average reflectance of the wall being at least 60%.

- For 75% of the area to ensure that the ratio between the average illumination of the ceiling (excluding the window.) and average illuminance of working surfaces should not exceeding 1:10, the weighted average reflectance over the ceiling being at least 85%.

4.7 Materials and Resources

LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

0	0	0	**Materials and Resources**		13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
			Credit	Building Life-Cycle Impact Reduction	5
			Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
			Credit	Building Product Disclosure and Optimization - Material Ingredients	2
			Credit	Construction and Demolition Waste Management	2

Figure 11 Credit points for Materials and Resources [11]

Figure 11 depicts the main topics and corresponding credit points for LEED Materials and Resources. The topics are discussed in more detail considering the requirements to achieve the credit points for the main criteria.

4.7.1 Storage and Collection of Recyclables

By managing storage and collection of recyclables, the main goal is to reduce the amount of waste produced by users of the building.

The site will have designated areas, where collection and storage of recyclables including paper, carton, glass, plastic and metal. Also batteries, mercury lamps and electronic waste will be sorted.

4.7.2 Construction and Demolition Waste Management

Construction waste, sent to landfill and burners, will be reduced, by extracting, reusing and recycling materials. Project site is required to

- Set goals for waste collection, the target amount of waste collected being 5 different types.

- Specify how to organize the collection either by separation of waste at the site or by collecting mixed waste and separating according to guide provided by a company responsible for collecting waste from the site.

- Submit a final report with a detailed description of the main waste streams, the percentage of collected and recycled waste.

In order to meet the requirements, project must prevent at least 50% of 3 different types of waste to end up in landfill or being burned.

4.7.3 Building Life Cycle Impact Reduction

The goal is to assess the life cycle of structures and internal surfaces and decrease the impact by at least 10% compared to initial project estimations in the three of the categories. Simultaneously, none of the categories should increase its impact by 5%.

The categories are

- the potential of global warming (mandatory category)
- damaging ozone layer (Trichlorofluoromethane)
- oxidation of land and water resources (hydron or sulfur dioxide)
- eutrophication (nitrogen or phosphate)
- Formation off ozone in the troposphere (nitrogen oxide or ethylene)
- depletion of non-renewable resources.

4.7.4 Building Product Disclosure and Optimization

The aim is to encourage the use of materials with available information about the life cycle, having positive economic, environmental and social impacts. Project team, responsible for the selection of products that support improved environmental impact of the life cycle, should have a reward system.

Environmental Product
There are two options for environmental product optimization:

1. Environmental Product Declaration (EPD), which involves using at least 20 different products from at least five different manufacturers that meet the EPD requirements.
2. Multi-parameter optimization, using products that comply with USGBC approved multi-attribute frameworks for 50% by cost of the total value of installed products in the project.

Sourcing of Raw Materials
There are two options for optimization of raw material sourcing:

1. Raw material and material production source reports including
    - location of raw material suppliers
    - commitment for long-term responsible use of land
    - complying with the standards for responsible use of raw materials.
2. Best means for raw material extraction complying with one of the requirements:
    - extended producer responsibility
    - materials derived from biological raw material
    - wood products

- reused materials
- materials with recycled content
- USGBC approved program.

Material Ingredients
There are three options for material ingredient optimization that may all be included into the program:

1. Material consistency report including
    - manufacturer laboratory testing
    - health product declaration
    - cradle-to-cradle certification
    - USGBC approved program.
2. Material consistency optimization for at least 25% by cost of total material value, accepted confirmations being
    - GreenScreen v 1.2 method
    - cradle-to-cradle certification
    - Registration, Evaluation and Authorisation of Chemicals (REACH) optimization
    - USGBC approved program.
3. Material manufacturer supply chain optimization by confirming that 25 % by cost of total material value
    - are supplied by manufacturers, participating in reliable and confirmed programs of health protection, safety, risk management concerning 99% of the produced materials
    - are supplied by manufacturers using independent third party chemical testing.

4.8 Innovation

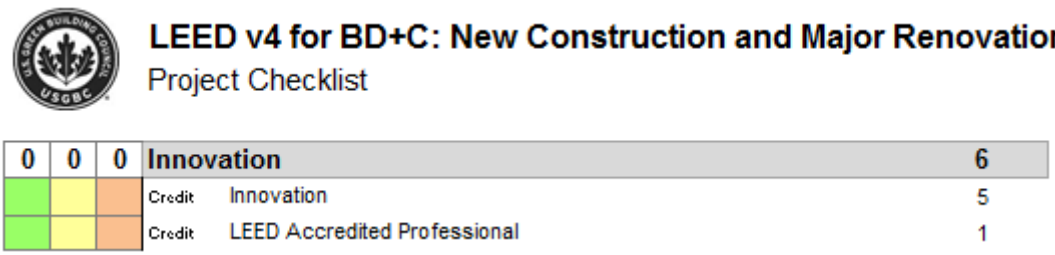

Figure 12 Credit points for Innovation [11]

The aim of Innovation criteria depicted in Figure 12 is to encourage projects to achieve remarkable results or implement innovative approaches.

There are three options for gaining credit points in innovations

1. Achieving significant and measurable environment indicators using strategies not included in LEED rating system.

2. Completing pilot test requirements from USGBC pilot test options.

3. Exceeding requirements of criterion 2 two times the required amount or reach the limit in advanced performance in criteria, where it is possible.

Project should also have a LEED accredited professional, whose responsibility is to encourage project team integration and simplify certification process.

4.9 Regional Priority

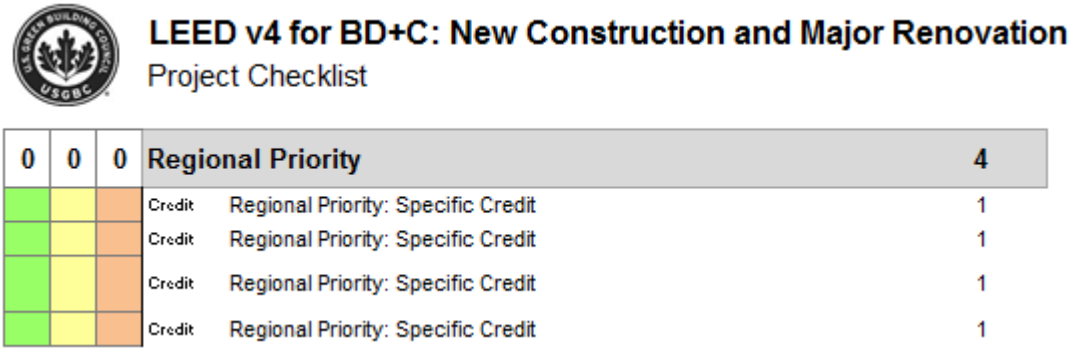

Figure 13 Credit points for Regional Priority [11]

The aim of Regional Priority criteria depicted in Figure 13 is to encourage the criteria that are reflecting the specific priorities of the regional environment, social responsibilities and health.

Credit points are awarded for completing 4 out of 6 criteria available in Russia:

- sensitive land protection
- rainwater protection
- light pollution reduction
- energy performance optimization
- habitat protection or restoration
- thermal comfort.

5 Conclusions

5.1 Overall Conclusions

In the beginning of this study, two main research questions are defined:

1. What companies operating in Russia are expecting concerning LEED certification and green building in the near future?
2. How should construction company act based on the knowledge gained from the first question?

Concerning the first question the main findings are, that majority of companies do not regard LEED important. Those companies that do, nevertheless, consider the growth of amount of certified green building projects and demand for green construction to be low. These predictions are supported by statistics that show low amount of previously certified projects in Russia. In addition, having lower requirements and standards than the companies themselves, local authorities do not support green building. The case study illustrates the in-depth green building requirements for an individual project and all of them are either LEED based or project specific, not being required by government.

Despite the initial negative results, some of the findings seem promising. In regards to second research question, this study managed to identify that Russian building market includes individual companies, that consider green building interesting, important and worth investing in regardless of possible additional costs. Based on the survey results the four key findings related to the second research question are

1. There is a lack capable green building contractors in Russia.

2. By differentiating, green building contractors will gain an access to a market with an immense competitive advantage comparing to contractors without capabilities.

3. Having the access to green building market in Russia, contractors will achieve a leading advantage and a pioneering position, in case there will be similar exponential growth of demand for green building as in North America and Europe.

4. Green building market in Russia provides opportunity not only to contractors but for certification organisations, architectures, designers and know-how companies to realise their potential.

Assuming the key finding would be realised, taking initiative in providing solutions and advertising while seeking potential buyers may trigger a productive result. Such attempts may raise the interest so called dormant companies and promote green building in general, having a positive impact on demand and producing more environmentally conscious projects in Russia.

5.2 Reliability of Results

Even though the conclusions seem promising and straightforward, it must be reminded that the survey encompassed only a sliver of potential participants operating in Russia. In case of this study, surprisingly consistent answers were managed to be obtained. However, the amount of participants could have been more abundant and versatile to add more variety to the study.

The nature of the questions must also be considered. All of the questions were rather general, not delving into specifics. The participants were not required to conduct a serious research, but merely express their personal opinions, based on their knowledge and experience in Russia. Not to undermine the importance of these qualities, however, additional work in order to produce quality answers would have added more credibility to the answers.

However, since the beginning the goal was to obtain a general impression on the situation concerning green building in Russia. Therefore the accuracy of the results is satisfactory. As a final note, it is advised to consider the results indicative and conduct further research on the topics of this study.

5.3 Further Research

Despite the general nature, this study provides more defined research paths for companies interested in entering green building market in Russia. Since the main indication is the green building being persistent in Russia, in the light of the key findings this study recommends researching topics in more depth:

- expanding one's knowledge on green building
- identifying potential clients interested in green building
- positioning the company, while considering the competence of competitors and requirements of client
- importance of initiative, providing customized solutions and knowledge sharing.

Clearly, looking into possibilities of potential for realising green building strategies in one's company, may bring fortunate results not only to the company itself, but to situation in Russia overall.

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A Appendix – Interview Questions

QUESTIONNAIRE: LEED CERTIFICATION PROGRAM

PART I – LEED IN GENERAL
ЧАСТЬ I – LEED В ОБЩИХ ЧЕРТАХ

Q01. How important does your company regard energy efficiency and environment issues, when planning and executing a new project? *(Choose one option)*

Насколько важными Ваша компания считает вопросы энергоэффективности и охраны окружающей среды при планировании и осуществлении нового проекта? *(Выберите один вариант)*

1. Very unimportant / Совсем неважно
2. Unimportant / Неважно
3. Neutral / Нейтрально
4. Important / Важно
5. Very important / Очень важно

Comments/ Комментарии

Q02. How familiar are your company with LEED rating system?
(Choose one option)

Насколько хорошо Ваша компания знакома с рейтинговой системой LEED?
(Выберите один вариант)

1. No information / Не знакомы
2. Little information / Немного информации
3. Basic knowledge / Базовая информация
4. Very knowledgeable / Хорошо осведомлен

Comments/ Комментарии

Q03. How experienced your company is in using LEED certification in the past 10 years?
(Choose one option)

Есть ли у Вашей компании опыт в использовании сертификации LEED за последние 10 лет?
(Выберите один вариант)

1. No experience / Опыта нет
2. Little experience / Немного опыта
3. A few certified projects / Несколько сертифицированных проектов
4. Many certified project /Много сертифицированных проектов
5. Most of our projects are certified / Большинство наших проектов сертифицированы

Comments/ Комментарии

Q04. How interested your company is in acquiring LEED certification in future projects? *(Choose one option)*

Насколько ваша компания заинтересована в приобретении сертификации LEED в будущих проектах? *(Выберите один вариант)*

1. Not interested / Не интересует
2. Low interest / Немного интересно
3. Interested / Интересно
4. Very interested / Очень интересно

Comments/ Комментарии

Q05. In your experience, which of the categories are most important, when achieving your green construction goals? *(Rate on an importance scale of 0-5. Please circle one option, numbers meaning: 0=No experience, 1=Very Unimportant, 2=Unimportant, 3=Neutral, 4=Important, 5=Very important)*

По вашему опыту, какие из категорий имеют наибольшее значение, при достижении зеленых целей в строительстве? *(Оценить на важность по шкале 0-5. Пожалуйста, обведите один вариант, Значение: 0=Нет опыта, 1=Совсем неважно, 2=Неважно, 3=Нейтрально, 4=Важно, 5=Очень важно)*

Consumption savings Экономия в потреблении	0	1	2	3	4	5
Energy efficiency Энергоэффективность	0	1	2	3	4	5
Sustainability Устойчивость	0	1	2	3	4	5
Life cycle Жизненный цикл	0	1	2	3	4	5
Innovation Инновации	0	1	2	3	4	5
Pioneering in Engineering Новаторство в инженерии	0	1	2	3	4	5
Global company policy Глобальная политика компании	0	1	2	3	4	5

Comments/ Комментарии

PART II – GREEN BUILDING CERTIFICATION PROGRAMS
ЧАСТЬ II – ПРОГРАММЫ СЕРТИФИКАЦИИ ЗЕЛЕНЫХ ЗДАНИЙ

Q06. How familiar you are with the following organisations?*(Rate on an importance scale of 1-5. Please circle one option, numbers meaning: 1=not familiar; 2=have heard the name only; 3=some information; 4=familiar; 5=have experience in their program)*
Насколько Вы знакомы со следующими организациями *(Оценить на важность по шкале 1-5 Пожалуйста, обведите один вариант, Значение: 1 = не знакомы; 2 = слышал только название, 3 = немного информации; 4 = информированы; 5 = имеем опыт в использовании их программы)*

BREEAM (UK/Великобритания)	1	2	3	4	5
LEED (US/ США)	1	2	3	4	5
HQE (France/Франция)	1	2	3	4	5
DGNB (Germany/Германия)	1	2	3	4	5
CASBEE (Japan/Япония)	1	2	3	4	5
GBCA, Green Star (Australia/Австралия)	1	2	3	4	5

Comments/ Комментарии

Q07. In Europe and Western countries the amount of BREEAM, LEED, DGNB and HQE-certified projects has significantly grown in recent years. Do you expect the similar phenomenon in Russia? *(Choose one option)*

В Европе и странах Запада количество сертифицированных проектов BREEAM, LEED, DGNB и HQE значительно выросло в последние годы. Ожидаете ли Вы подобное явление в России? *(Выберите один вариант)*

1. No growth / Не вырастит
2. Little growth / Невысокий вырост
3. Growth / Вырост
4. High growth / Высокий рост
5. No experience / Нет опыта

Comments/ Комментарии

Q08. In your opinion, which of the following certification program organisations will be most popular in Russia in future? *(Choose one option)*

На ваш взгляд, какая из следующих организаций по сертификации будет наиболее популярной в России в будущем? *(Выберите один вариант)*

1. None / Ни одна
2. BREAAM
3. LEED
4. HQE
5. DGNB
6. CASBEE
7. GBCA, Green Star
8. Some other organisation(s), which one?
   Какая-нибудь другая организация, какая?
   _____

Comments/ Комментарии

PART III – GREEN BUILDING SECTOR AND DEVELOPMENT OF LEED IN RUSSIA
ЧАСТЬ III – ЗЕЛЕНОЕ СТРОИТЕЛЬСТВО И РАЗВИТИЕ LEED В РОССИИ

Q09. Russian government has recently approved a new standard concerning energy efficiency - GOST R 54964-2012, STO NOSTROY 2.35.4-2011 and STO NOSTROY 2.35.69-2012. In your experience, how demanding are local authorities considering green construction at this moment? *(Choose one option)*

Правительство России одобрило новые стандарты, касающиеся энергоэффективности, ГОСТ Р 54964-2012, СТО НОСТРОЙ 2.35.4–2011 и СТО НОСТРОЙ 2.35.68–2012. По вашему опыту, насколько требовательны местные власти касательно зеленого строительства на данный момент? (Выберите один вариант)

1. No demand / Нетребовательны
2. Little demand / Требований мало
3. Demanding / Требовательны
4. Very demanding / Очень требовательны
5. No experience / Нет опыта

Comments/ Комментарии

Q10. How demanding are your own company green standards and requirements compared to the demands of local authorities? *(Choose one option)*

Насколько требовательна Ваша компания касательно зеленого строительства по сравнению с местными властями? (Выберите один вариант)

1. We have no requirements / У нас нет требований
2. Our requirements are lower / Наши требования менее строгии
3. Our requirements are the same / У нас одинаковые требования
4. Our requirements are higher / Наши требования более строгие

Comments/ Комментарии

Q11. How do you consider the growth of demand for green construction (in general) in the following 10 years in Russia? *(Choose one option)*

Как Вы считаете, вырастит ли спрос на зеленое строительство (в целом) в течение следующих 10 лет в России? (Выберите один вариант)

1. No growth / Не вырастит
2. Low growth / Невысокий вырост
3. Growth / Вырост
4. High growth / Высокий вырост
5. No experience / Нет опыта

Comments/ Комментарии

Q12. In your opinion, how important is the added value by contractor in green construction in Russia at this moment? *(Choose one option)*

На ваш взгляд, насколько важными являются дополнительные услуги, предлагаемые подрядчиком в зеленом строительстве в России на данный момент? (Выберите один вариант)

1. Very unimportant / Совсем неважно
2. Unimportant / Неважно
3. Neutral / Нейтрально
4. Important / Важно
5. Very important / Очень важно
6. No experience / Нет опыта

Comments/ Комментарии

Q13. At the moment, do you find enough civil and engineering contractors that focus on green construction in Russia? *(Choose one option)*

На данный момент, в России достаточное количество гражданских и инженерных подрядчиков, которые сосредотачиваются на зеленом строительстве? (Выберите один вариант)

1. None / Ни одного
2. Very few / Очень мало
3. Some / Несколько
4. Many / Много
5. Most of the contractors / Большинство

Comments/ Комментарии

PART IV – LEED COST-EFFICIENCY
ЧАСТЬ IV – ЭКОНОМИЧНОСТЬ LEED

Q14. In your experience, how green solutions have impacted the cost-savings in projects? *(Choose one option)*
По вашему опыту, как зеленые решения влияют на экономию средств осуществленных проектов? (Выберите один вариант)

1. Additional cost / Дополнительные расходы
2. Some additional cost / Некоторые дополнительные расходы
3. Some cost-savings / Некоторая экономия затрат
4. Cost-savings / Экономия затрат
5. No experience / Нет опыта

Comments/ Комментарии

Q15. If the green solutions are demanding additional cost, are they worth it in the long run? *(Choose one option)*

Если зеленые решения требуют дополнительных затрат, стоят ли они того в долгосрочной перспективе? (Выберите один вариант)

1. Yes / Да
2. No / Нет
3. No experience / Нет опыта

Comments/ Комментарии

Q16. Currently, the cost of energy in Russia is lower than in other European countries. Is it worth investing in more energy efficient solutions considering the future development of energy market in Russia? *(Choose one option)*

В настоящее время стоимость энергии в России ниже, чем в других европейских странах. Стоит ли инвестировать в более энергоэффективные решения с учетом будущего развития энергетического рынка в России? (Выберите один вариант)

1. Very unimportant / Совсем неважно
2. Unimportant / Неважно
3. Neutral / Нейтрально
4. Important / Важно
5. Very important / Очень важно

Comments/ Комментарии

PART V – INFORMATION ON GREEN SOLUTIONS
ЧАСТЬ V - СВЕДЕНИЯ О ЭКОЛОГИЧНЫХ РЕШЕНИЙ

Q17. How often contractors propose you alternative green solutions in project realisation phase? *(Choose one option)*

Как часто подрядчики предлагают Вам альтернативные зеленые решения в фазе реализации проекта? (Выберите один вариант)

1. Never / Никогда
2. Rarely / Редко
3. Sometimes / Иногда
4. Often / Часто

Comments/ Комментарии

Q18. If you receive green solution propositions, how often do you implement them? *(Choose one option)*

Если Вам предлагают экологичные решения, как часто Вы их реализовываете? (Выберите один вариант)

1. Never / Никогда
2. Rarely / Редко
3. Sometimes / Иногда
4. Often / Часто
5. No experience / Нет опыта

Comments/ Комментарии

Q19. How often do you look for information about recent technical innovations concerning energy saving aspects? *(Choose one option)*

Как часто Вы ищите информацию о последних технических новшеств, касающихся аспектов энергосбережения? (Выберите один вариант)

1. Never / Никогда
2. Rarely / Редко
3. Sometimes / Иногда
4. Often / Часто

Comments/ Комментарии

Q20. Would you be interested in a newsletter with descriptions of cost-saving solutions that contractors have recently applied on their on-going projects? *(Choose one option)*

Вы были бы заинтересованы в рассылке с описанием экономичных решений, которые подрядчикам удалось реализовать на их текущих проектах? (Выберите один вариант)

1. No interest / Не заинтересованы
2. Little interest / Немного интересно
3. Interested / Интересно
4. Very interested / Очень интересно

Comments/ Комментарии